[19] State Intellectual Property Office of P. R. China [51] Int. Cl^7

A61F9/00
G02B 27/08

[12] Public Explanation for Patent Application
[21] Application No. 99115935.7

[43]Date of publication: 2000.07.19 [11] No. CN 1260162A

[22] Application date: 1999.12.10 [21] Application No. 99115935.7

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2 pages of Claims, 9pages of specification, 3 pages of illustrations

[54] Name of invented item: Optic Biological Frequency Spectrograph

[57] Abstract

The invention is an optic biological frequency spectrograph for the treatment of amblyopia, pseudomyopia and presbyopia. It consists of a shell, which contains a cylinder. On the front cover of the cylinder is an eyelet; on the back end there is an illumination lamp-house and a reflector unit. In the shell, there is also a power supply, microcomputer controller and a sound-making device. The microcomputer controller produces a flashlight and a flash picture of which the spectrum, intensity, frequency and picture change automatically in accordance with a preset procedure and music procedure. The flashlight and flash picture stimulate and temper the pyramidal cells to improve the conductive function, raise the threshold value of the sensitivity of the optic nerve to biological light of specific wavelengths, and increase the frequency of convergence between the visual input and critical point. This will reduce the operational requirements and enhance curative effect.

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Claims

1. The optic biological frequency spectrograph includes a hollow cylinder (6) installed in the shell (1), a front cover (2) with an eyelet fixed on the cylinder (6), an illumination lamp-house (4) at the back end of the cylinder (6) along the central line, and a reflector set between the lamp-house (4) and the front cover (2). Inside the shell (1), there is also a power supply (11) and a microcomputer controller (5) and sound-making device (10) connected with the power supply (11). The shell (1) is connected with the base (9) using a bracket (7). The lamp-house (4) is a group of radiation devices, emitting light with intensities ranging from 30 to 200mcd and peak value wavelengths of 600-680nm, 570-590nm, 530-565nm and 430-460nm, respectively. The feature lies in the principle in which the treatment procedure and the music program are preset using the microcomputer controller (5), which manages several groups of spectrum shifts, intensity shifts and picture shifts, and several groups of fixed frequency shifts below the critical convergence frequency for human vision, as also manages music frequency conversion, and controls the lamp-house (4) in producing flash pictures, in which the light intensity, frequency, wavelength and picture change to the preset treatment procedure or the music program, while simultaneously playing music.

2. According to the optic biological frequency spectrograph described in Article 1 in the Claims, the characteristics are that the microcomputer controller (5) includes a microcontroller (30), the audio output of which is connected with a sound-making device (10), and an RS switch (32) designed to select different treatment schemes and procedures, a switch (12) that is a touch switch for starting treatment procedures and reset. Inside the microcontroller (30) is a sound synthesizer. The multiplex driver amplifier (33) is connected to the I/O of the microcontroller (30); and each driver end of the amplifier is connected with an individual radiation device on the lamp-house. The power supply (11) is connected with the microcontroller (30) via the power switch (31).

3. The characteristics of the optical biological frequency spectrograph as described in Article 1 of the Claims lies in the fact that the illumination lamp-house consists of several groups of LEDs arranged in a specific order. Each LED group gives off light of the same color.

4. According to the optic biological frequency spectrograph as described in Article 1 and Article 2 of the Claims, the characteristics are that the model of the microcontroller (30) is HT84XX. Its I/O ports 2, 3, 4 and 5 are connected with transistors Q1, Q2, Q3 and Q4 in the driver amplifying circuit, respectively, and use the amplified electric current of the transistors microcontroller to operate LED L1, L2, L3 and L4. I/O port 7 and port 8 are connected to the program status

indicator lamp; I/O port 1 and port 9 are connected to the LED L5 group and operate them to produce light. These lights vary in intensity with the setting of different resistance values of the current limiting resistors R10 and R15 and with the setting of on/off procedures at different I/O ports. Ports 21-24 are connected with a start switch (START/STOP) and program selection RS switch, a music signal output port (14, 15) and a sound-making device SP (10).

5. According to the optic biological frequency spectrograph described in Article 1 of the Claims, the characteristics are in the fact that the bracket (7) is fixed on the lower part of the shell (1); and the bracket (7) is a ball socket linked with the base (9).

6. According to the optic biological frequency spectrograph described in Article 1 of the Claims, the characteristics lie in the fact that the front cover (2) is mounted on the circular hole in the front of the shell (1) with the two central lines superimposed with each other, and is connected with the shell (1) by means of a retaining ring; the front cover (2) and the eye patch(8) mounted thereon can be turned 180°; on one end of the eye patch, there is an eyelet, and the other end is sealed; the end with the eyelet is key jointed with the front cover (2); and its central lines are superimposed with that of the eyelet on the front cover (2) and the circular hole in the front of the shell.

Specifications
Optic Biological Frequency Spectrograph

The invention concerns an apparatus for the treatment and heath care of eyes and belongs to the kaleidoscope category. In particular, it is an apparatus for the physical treatment of amblyopia, pseudomyopia and presbyopia and for the protection of eyesight.

It is well known that the kaleidoscope, invented more than 100 years ago, contains fragments of glass and plastics of different colors. Turning the cylinder reveals different pictures. The designer of this invention has already introduced an "electronic music kaleidoscope" CN89215916, which uses electronic circuits and luminous elements instead of colorful glass and plastic fragments. When the luminous elements are giving off light, electronic color pictures become visible. This adds more colors to the ancient kaleidoscope, but this new device is for entertainment only.

Amblyopia is a visual disturbance that has many potential causes. Usually, it cannot be redressed simply by wearing glasses. To date, there are many methods for the treatment of amblyopia. One effective therapy adopts the principle of red light flashes to exercise the cortical area in the eye suffering from amblyopia. China patents CN90202156 and CN94212912 introduced a health care electronic kaleidoscope for amblyopia adopting the principle described above. In those devices, the lamp-house group is limited to the flash of a red light of specific intensity and frequency, which stimulates and excites the yellow spot area of the retina to achieve its curative purpose. This device has offered a technical solution to the difficult problem posed by the high manufacturing costs of amblyopia cure apparatus, providing a therapeutic and health care apparatus for common households. In addition, there are other therapeutic apparatuses adopting the principle of red light flashes, such as China patents CN86200467, CN88217622. The principle in the treatment offered by these devices is based on the fact that the yellow spot area of the retina is sensitive to the red light of a wavelength of 600-680nm, and by means of increasing sensory input and critical convergence frequency the purpose of exercising and enhancing the eyesight can be achieved. But the theoretical basis and treatment methods of all of the apparatuses described above have neglected the fact that there exist in human eyes different types of vision receptors for colors. Research into modern visual electro physiology and the

theory of chromatic vision shows that the human body has three types of pyramidal cells in the retina, and their absorption peaks for spectrums are 570-590nm, 530-565nm and 430-460nm. In other words, they are most sensitive to and more excited by lights of these wavelengths. Modern visual electro physiology and the theory of chromatic vision also show that there is an allopathic mechanism in human vision with respect to color. There are four types of color-sensitive cells that confront one another, among which ganglion cells of the retina and corpusgeniculatum cells on the outer side are the most important. The first type of cells are sensitive to red light of 600-680nm, but is inhibited by green light of 530-565nm; the second type works in a contrary manner; that is, it is inhibited by red light but sensitive to green light. The third type is inhibited by blue light of 430-460nm, but is sensitive to yellow light of 570-590nm; the fourth type has a contrary response to these lights, namely, it is inhibited by yellow light but sensitive to blue light. Besides these, based on advances in visual electro physiology, the visual evoked potential (VEP) is also related to changes in the intensity of light stimulus and the light intensity, changes in frequency and flash pictures and pictures. Experiments show that the evoked potential response arising from the change of intensity and frequency is greater than that which occurs under light of fixed intensity and fixed frequency; the evoked potential response arising from the flash picture stimulus is greater than that from the stimulus of light of simple uniform intensity; the evoked potential response arising from a changing flash picture is greater than that from a simple flash picture, the evoked potential response from pictures with a high contrast is larger than that from those of low contrast. As the therapeutic apparatuses described above adopt oscillating impulse circuits with simple structures, their flash frequencies are fixed and neither the monotony nor the light intensity of the flash can be changed automatically. Usually, they provide an invariable stimulus using one or two types of light, which produce a low picture contrast. Given the limitations of therapeutic method or light source, the range of wavelengths of the light deviates from the central area, to which the pyramidal cells of human body's retina are most sensitive. These apparatuses, compared with advances in modern electro physiology, are clearly underdeveloped and inadequate, and hinder further improvements in the curative effect. Also, given the limitations on the structures and circuit designs of the apparatuses described above, their operating principles and methods are complex, which cause significant inconvenience and problems from young patients and adversely impact the actual curative effects.

This invention aims to provide a visual biological frequency spectrograph that employs several well-arranged groups of light-emitting devices as an illumination lamp house. Those devices give off red, green, blue or yellow light and their light wavelengths are closer to the central peak value wavelengths of the light, to which human body's retina pyramidal cells are most sensitive and which best excite with the cells. Meanwhile, the optimized treatment scheme, which performs a shift of multiple groups of spectrums, shift of frequencies, shift of pictures and a shift of light intensity, are programmed. By way of changing the multi-route and frequency of the micro-computer controller, flash lights and flash pictures are produced with spectrum,

intensity, frequency and picture that automatically change according to the preset procedure and the music program. The light and picture emitted stimulate and exercise the different types of visual cells in the retina, improve the conductive function, increase the sensitivity of the visual cells to biological lights of specific wavelengths, raise the sense input and critical convergence frequency of human eyes and further reduce the requirements for operation and enhance the curative effect.

This invention can be implemented using the following technical scheme. On the basis of the fact that there are three types of pyramidal cell in human retina, which are most sensitive to lights of a specific wavelength, and on the basis of the allopathic mechanism and advances in VEP, light intensity, frequency, spectrum, flash, picture contrast and other areas in the field of visual electro physiology research, this invention adopts light-emitting devices as illumination light source 4. They emit light in red, yellow, green and blue with an intensity of 30-200mcd and a wavelength of 600-680nm, 570-590nm, 530-565nm and 430-460nm.
The treatment program and music program are preset on microcomputer controller 5, and perform several sets of spectrum shift, intensity shift, image shift and several sets of fixed frequency shift below CFF as well as music frequency shift.

These programs control the multiplex driver amplifier 33 and operate each group of lighting devices on the lamp-house 4 in sequence, producing flash lights and flash images resulting from automatically changes in spectrum, intensity, frequency and image according to the preset treatment program, with music played synchronously. The flash lights and flash images produced by lamp-house 4, with image contrast further enlarged through repeated reflection by the reflectors 3, stimulate and exercise the three different types of pyramidal cells in the yellow spot area of the retina, improve vision conduction, increase the threshold value of optic sensitivity, increase the frequency of convergence between visual input and critical point, and finally improve and enhance the curative effect.

This invention has the following active effects: 1. It supplies many types of lights of specific wavelengths more attuned to the sensitivity of pyramidal cells in the human retina, and better able to excite those cells, flash lights whose light intensity, frequency, spectrum and image can change automatically, and flash images with larger image contrast. The lights of specific wavelength, flash lights with constantly changing spectrum wavelength, frequency and light intensity, and images which alternative more effectively stimulate the optic nerve, reducing adaptability to flash lights and flash images. Meanwhile the music frequency spectrum biologic light produced can massage the ocular tissue, activate many types of optic cells in the optic nerves more effectively, improve the function of vision conduction, enhance optic resolution, and increase the frequency of convergence between visual input and critical point, thereby effectively enhancing treatment of amblyopia. 2. The music frequency spectrum biologic light produced can massage ocular tissue, accelerate tissue circulation, while the flash light and its light intensity change can lead to pupil

reflection and crystal adjustment, improve the capability of dioptric adjustment, eliminate optic fatigue and delay presbyopia. 3. The eye patch can be turned with ease to ensure that the eye treatment is free of external disturbances and can cover completely the other eye not be treated, improving the curative effect. 4. The shell is on the base and its angles of turning and pitching can be adjusted freely. This ensures that the eye being treated can be readily directed to the sight aperture even among patients of different ages. 5. Gentle and relaxing music is supplied simultaneously. Synchronous effects on hearing and vision can further excite the sympathetic nerves, enhance the interest of infant and juvenile patients in treatment and enhance the curative effect. 6. Because a microcomputer control technique is used, the degree of automation through the course of treatment is increased, and the requirements of use and operation for the patient are reduced. This helps to cure and promote family health care. 7. There are clear improvements in the curative effect and a reduced treatment cycle. According to clinics, the general efficiency rate for the treatment of amblyopia can reach 94.18%, while that for the treatment of pseudomyopia can reach 99%.

A further explanation of the invention will be given next with the attached drawings.

Drawing 1 shows the overall frame of the invention, including (a) its planform and (b) cutaway.
Drawing 2 maps the microcomputer controller.
Drawing 3 is a schematic diagram of microcontroller MCU HT84XX adopted in the invention.
Drawing 4 shows the light emitting devices unit.

In Figure 1, cylinder 6 is a hollow cylinder, and front cover 2 is set with an eyelet and fastened to the front of the cylinder 6. At the back end of cylinder 6; along the central line is a lamp-house 4, with reflectors 3 between the lamp-house 4 and the front cover 2. The shell 1 has a bent surface with a round aperture at the front, consisting of an upper cover and a lower cover. Around the round aperture is a pulling path and stop block, which are used for connection with the front cover. Inside is a power supply 11, a microcomputer controller 5 and sound-making device 10; shell 1 is connected with base 9 through bracket 7. Bracket 7 is fastened on the lower part of the shell 1. The connection between the bracket 7 and the base 9 is spherical. The shell 1 can turn freely at 360 degrees and adjust the pitching angle with the base 9 as a benchmark. At the front of the shell 1 is a program start switch 12. Touching the switch 12 will start or stop the treatment program automatically. The front cover 2 is located on the round aperture in the front of the shell 1, the two central lines are superimposed and they are connected with the shell 1 in a retaining ring structure, which enable the front cover 2 and the eye patch 8 on the front cover to execute 180-degree turns. On one end of the eye patch 8 is an eyelet, while the other end is closed. The end with an eyelet is key jointed on the front cover 2, its central line is superimposed with the central line of the eyelet on the front cover 2 and the central line of the round aperture on the front

of the shell 1. By turning the eye patch 8, the eye being treated will be directed to the eyelet on the eye patch 8, while the other eye will be covered by the other end of the eye patch 8. The reflectors 3 mentioned above consist of three rectangular reflectors, with a triangular section. To produce a solid image and increase the image scene contrast, the reflectors 3 should consist of three trapezoid baffle-boards which reflect by a single side and one end of the section towards the lamp-house 4. The sound-making device 10 is fitted inside the shell 1, which has many holes to ensure sound transfer. The power supply 11 is a direct current, such as a battery; although a stable power supply can also be used.

Figure 2 illustrates the control circuit of the specific MCU used in the microcomputer controller 5. In the figure, MCU 30 is the main controller and its audio output port is connected to the sound-making device 10. The RS switch for program selection 32 can choose different treatment schemes and programs to satisfy the different needs of patients . Switch 12 is a touch switch that launches and resets the treatment program. The MCU 30 sets the treatment program and music program, and has a sound synthesizer mounted internally. Multiplex driver amplifier 33 is connected to the I/O port of the MCU 30, and its driver ports are connected to each lighting device on lamp-house 4 separately. The multiplex driver amplifier 33 is a multi-channel current amplifying circuit. The power supply 11 is connected to the MCU 30 by switching power supply 31. To control the work of the lamp-house 4, the stated lamp-house 4 consists of LEDs of wavelength 600-680nm, 570-590nm, 530-565nm and 430-460nm, respectively, and each group of LED is in the same color, forming a geometrical figure. The number of each LED group is 1-8. To make figures more abundant, several groups of LED can be adopted, with four to eight groups being the most common.

To improve reliability and reduce production costs, the MCU 30 is a microcomputer mask chip that sets the treatment program together with the music program, with a sound synthesizer, such as HT84XX.

In Figure 3, the type of the MCU 30 is HT84XX. Its I/O ports 2, 3, 4, 5 are connected to transistors Q1, Q2, Q3 and Q4, respectively, in the driver amplifying circuit, and LED L1, L2, L3 and L4 are operated through the amplified electric current of the transistors . Because L5 needs a smaller current, it can be operated directly by I/O port 1 and port 9 of the MCU. The colors of the LED in the figure are shown in R (red), G (green), Y (yellow) and B (blue). I/O port 7 and port 8 are connected to the program status indicator lamp; port 1 and port 9 of I/O are connected to and operate one group of LED L5, making L5 produce light that varies in intensity by setting different resistance values for the current limiting resistors R10 and R15 and by setting on/off programs at different I/O ports; ports 21-24 are connected to the START/STOP and RS switch for program selection separately, and with the RS switch different treatment programs can be chosen. Ports 14 and 15 in the figure are for music signal output, and are connected to the sound-making device SP. The SP can be a speaker, and headphones can be used. Port 15 is connected to an anode of 5 Volt DC power, and port 18 connects to the earth.

The treatment program and music program are set in the MCU. The operating

procedure of the treatment program mainly follows the basic principle of making the LED produce a spectrum shift, light intensity shift, frequency shift and image change. The music program can be in MIDI or audio format, although MIDI is preferred for a clearer and more comfortable rhythm, and reduce program memory. The rhythm of the selected music should be clear and comfortable. The treatment program mainly controls the flashes and changes of LED. The following operating procedure and control can be applied: touch START/STOP switch, program controls L1 (blue) to light for 1/3 second---L2 (red) to light for 1/3 second--- L3 (red) to light for 1/3 second--- interval of 1/2 second---repeat the procedure, the operating period is two minutes; followed by L1 to light for 1/6 second--- L2 to light for 1/6 second--- L3 to light for 1/6 second--- interval of 1/2 second---repeat the procedure, the operating period is one minute; followed by program control, I/O port 1 is "1," make L5 (yellow) light for one second---control I/O port 9 and port 1 all are "1," L5 (yellow) light for one second--- control I/O port 9 to be "1" and port 1 to be "0," L5 (yellow) light for one second--- control I/O port 9 and 1 all are "0," L5 (yellow) extinguish for 3 seconds---repeat the above procedure for two minutes; then use the music program to synchronously play music and control the turning and shift speed rate of LEDs to accompany changes in music frequency. The lighting change frequency of LEDs with music changes ranges from 0.5-20Hz, the shift lighting sequence is L1 (blue) ---L2 (red) ---L3 (red) ---L4 (green), for three minutes, ending with treatment program and music program finish and standby. The flash means of LEDs can have many changes, such as shift lighting in sequence or shift flash in sequence , or could be random shift lighting or random shift flash. The operating rate of flashes can be many sets.

Figure 4 is an implementation example of the LEDs that line lamp-house 4. The LEDs are red, yellow, green and blue semiconductor LED groups, of wavelengths 600-680nm, 570-590nm, 530-565nm and 430-460nm, respectively. The number of lighting device groups is five, and they form a geometrical figure. The number of LEDs in each group is 1-8, and in the same color, such as L1, L2.....L5, in the figure. The number of LEDs in each group depends on the requirements for lighting intensity and image of the chosen LED. If more images are required, a large number of LED groups and more LEDs in each group can be chosen. To reduce the volume and improve image quality, LEDs can be sealed on the board of lighting devices.

Attached Drawings

Drawing 1

Drawing 2

Drawing 3

Drawing 4

[19]_State Intellectual Property Office of P. R. China—_—_—_—_ [51]_Int. Cl7
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2 pages of ~~right-claiming document~~Claims, 9pages of specification, 3 pages of illustrations

[54] Name of invented item: Optic Biological Frequency Spectrograph
[57] Abstract

The invention ~~is~~ is an optic biological frequency spectrograph for the treatment of amblyopia, pseudomyopia and presbyopia. It consists of a shell, ~~in~~ which contains a cylinder. On the front cover ~~to~~ of the cylinder~~,~~ ~~there~~ is an eyelet; on the back end~~,~~ there ~~are~~ is an illumination lamp-house and a reflector unit. In the shell, there ~~are~~ is also a power supply, microcomputer controller and a sound-making device. The microcomputer controller produces a flashlight and a flash picture of which the spectrum, intensity, frequency and picture change automatically in accordance with ~~the~~ a preset procedure and music procedure. The flashlight and flash picture stimulate and temper the pyramidal cells ~~so as~~ to improve the conductive function, raise the threshold value of the sensitivity of the optic nerve to biological light of specific wavelengths, and increase the frequency of convergence between the visual input and critical point. This will reduce the operational requirements and enhance curative effect.

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~~Right-claiming Document~~Claims

1. The optic biological frequency spectrograph includes a ~~-through~~ hollow cylinder (6) installed in the shell (1), –a front cover (2) with an eyelet ~~and~~ fixed on the cylinder (6), an illumination lamp-house (4) at the back end of the cylinder (6) along the central line, and a reflector set ~~in~~ between the lamp-house (4) and the front cover (2). Inside the shell (1), there ~~are~~ is also a power supply (11) and a microcomputer controller (5) and sound-making device (10) connected with the power supply (11). The shell (1) is connected with the base (9) ~~through~~ using a bracket (7). The lamp-house (4) ~~mentioned above~~ is a group of radiation devices, ~~giving off~~emitting lights with ~~the~~ intensiti~~y~~es ranging— from 30 to 200mcd and ~~the~~ peak value wavelengths of 600–680nm, 570–590nm, 530–565nm and 430–460nm, respectively. The feature— lies in the principle ~~that~~ in which the treatment procedure and the music program are preset ~~in~~ using the microcomputer controller (5), which manages several groups of spectrum shifts, intensity shifts and ~~,~~ picture shifts, and several groups of fixed frequency ~~shift~~ shifts below the critical convergence frequency for human vision, ~~as well as~~as also manages music frequency conversion, and controls the lamp-house (4) in producing flash pictures, ~~of~~ in which the light intensity, frequency, wavelength and picture change to the preset treatment procedure or the music program, while simultaneously ~~and~~ playing music ~~simultaneously~~.

2. According to the optic biological frequency spectrograph ~~as~~ described in ~~the a~~Article 1 in the ~~right-claiming document~~Claims, the characteristics ~~is~~ are that the microcomputer controller (5) includes a microcontroller (30), the ~~whose~~ audio output ~~is~~ of which is connected with ~~the~~ a sound-making device (10), and an RS switch (32) ~~intended for selecting~~designed to select different treatment schemes and procedures, a~~,~~ switch (12) ~~which~~ that is a touch switch for starting treatment procedures and reset. Inside the microcontroller (30)~~,~~ ~~there~~ is a sound synthesizer. The multiplex driver amplifier (33) is connected to the I/O of the microcontroller (30); and each driver end of the amplifier is connected with an individual radiation device on the lamp-house ~~respectively~~. The power supply (11) is connected with the microcontroller (30) ~~through~~ via the power switch (31).

3. The characteristics of the optical biological frequency spectrograph as described in ~~the~~ Article~~article~~ 1 of the ~~right-claiming document~~Claims lies in the fact that the— illumination lamp-house consists of several groups of LEDs arranged in ~~specific~~ a specific order. Each ~~group of~~ LED group gives off light ~~in~~ of the same color.

4. According to the optic biological frequency spectrograph as described in ~~article~~Article 1 and ~~article~~Article 2 of the ~~right-claiming document~~Claims, the characteristics ~~is~~ are that the model of the microcontroller (30) is HT84XX. Its I/O ports 2, 3, 4 and 5 are connected with transistors Q1, Q2, Q3 and Q4 in the driver amplifying circuit, respectively, and ~~by~~ use the amplified electric current of the transistors microcontroller to operate ~~drive the~~ LED L1, L2, L3 and L4 ~~to work~~. I/O port 7 and port 8 are connected ~~with~~ to the— program status indicator lamp-; I/O port 1 and port 9 are connected to the ~~group of~~ LED ~~L5~~ L5 group and ~~drive~~ operate them to produce light. These lights vary in intensity ~~by~~ with the setting of different resistance values of the current limiting resistors R10 and R15 and ~~by~~ with the setting of on/off procedures at different I/O ports. Ports 21-–24 are connected with a start switch (START/STOP) and program selection RS switch, a music signal output port ~~of music signal~~ (14, 15) and a sound-making device SP (10) ~~respectively~~.

5. According to the optic biological frequency spectrograph ~~as~~—described in ~~article~~Article 1 of the ~~right-claiming document~~Claims, the characteristics ~~is~~ are in the fact that the bracket (7) is fixed on the lower part of the shell (1); and the bracket (7) is a ball socket linked— with the base (9).

6. According to the optic biological frequency spectrograph ~~as~~—described in ~~article~~Article 1 of the ~~right-claiming document~~Claims, the characteristics lies in the fact that the front cover (2) is mounted on the circular hole in the front of the shell (1) with the two central lines superimposed with each other, and is connected with the shell (1) by means of a retaining ring; the front cover (2) and the eye patch(8) mounted ~~on~~ thereon can be turned ~~in~~ 180°; on one end of the eye patch, there is an eyelet, and the other end is sealed; the end with the eyelet is key jointed with the front cover (2)-; and its central lines are superimposed with that of the eyelet on the front cover (2) and the circular hole in the front of the shell.

Specifications

Optic Biological Frequency Spectrograph

The invention concerns an ~~kind of~~ apparatus for the treatment and heath care of eyes and belongs to the kaleidoscope category. In ~~, and in~~ particular, it is an apparatus for the physical treatment of amblyopia, pseudomyopia and presbyopia and for the protection of eyesight.

It is well known ~~to all~~ that the kaleidoscope, invented ~~over~~ more than 100 years ago, ~~has~~ contains fragments of glass and plastics ~~in~~ of different colors ~~therein~~. Turning the cylinder~~,~~ ~~one can see~~reveals different pictures ~~in it~~. The designer of this invention has ~~once~~ already introduced ~~publicized a kind of~~an "electronic music kaleidoscope" CN89215916, which uses electronic circuits and luminous elements instead of colorful glass and plastic fragments. When the luminous elements are giving off light, ~~one can see~~ electronic color pictures become visible. This adds more colors to the ancient kaleidoscope, but this new device is ~~only~~ for entertainment only.~~,~~

Amblyopia is a visual disturbance ~~caused by many reasons~~that has many potential causes. Usually, it cannot be redressed ~~by~~ simply by wearing glasses. ~~So far~~To date, there are many methods for the treatment of amblyopia. One ~~of the~~ effective therapy~~ies~~ adopts the principle of red light flashes to exercise the cortical area in the eye suffering from amblyopia. China patents CN90202156 and CN94212912 ~~published~~ introduced a ~~kind of~~ health care electronic kaleidoscope for amblyopia adopting the ~~afore-mentioned~~ principle described above. In those devices, the lamp-house group is limited to ~~a~~ the flash of a red light ~~in~~ of specific intensity and frequency, which stimulates and excites the yellow spot area of the retina ~~so as~~ to ~~attain~~ achieve its curative ~~the~~ purpose ~~of curability~~. This device has ~~solved~~ offered a

technical solution to the difficult problem ~~of~~posed by the ~~"expensive~~high manufacturing costs ~~for~~ of amblyopia cure apparatus~~" technologically~~, providing a therapeutic and health care apparatus for common households. ~~Besides this~~In addition, there are ~~some~~ other therapeutic apparatuses adopting the principle of red light flashes, such as China patents CN86200467, CN88217622 ~~and others~~. The ~~treatment~~ principle ~~of~~ in the treatment offered by these devices is ~~those are~~ based on the fact that the yellow spot area of the retina is sensitive to the red light ~~in~~of ~~the~~ a wavelength of 600-~~~~680nm, and by means of~~—~~ increasing ~~sense~~ sensory input and critical convergence frequency the purpose of— exercising and enhancing the eyesight can be achieved. But the theoretical basis and treatment methods of ~~the~~ all of the ~~above-mentioned~~ apparatuses described above have neglected the fact that there exist in human eyes different types of vision receptors for colors. Research ~~of~~ into ~~the~~ modern visual electro physiology and the theory of chromatic vision shows that the human body has three types of pyramidal ~~cell~~ cells in the ~~in~~ retina, ~~and their~~and their absorption peaks for spectrums ~~are~~ are 570-~~~~590nm, 530-~~~~565nm and 430-~~~~460nm ~~respectively~~. In other words, ~~, namely~~ they are most sensitive to and more excited ~~with~~ by ~~the~~ lights of these wavelengths. ~~The~~Modern ~~—modern~~ visual electro physiology and the theory of chromatic vision also show that there is an allopathic mechanism in human vision ~~to~~ with respect to color.~~s.~~ There are four types of color-sensitive cells that confront one another, among which ganglion cells of the retina and corpusgeniculatum cells on the outer side are the most important ~~representative~~. The first type of cells are sensitive to ~~the~~ red light of 600-~~~~680nm, but is inhibited by ~~the~~ green light of 530-~~~~565nm; the second type works in a contrary manner; that is-, it is inhibited by red light but sensitive to green light. T~~t~~he third type is inhibited by ~~the~~ blue light of 430-~~~~460nm, but is sensitive to ~~the~~ yellow light of 570-~~~~590nm; the fourth type has a contrary response to these lights, namely, it is inhibited by ~~the~~ yellow light but sensitive to ~~the~~ blue light. Besides these, based on ~~the~~ advances ~~achievement~~ in ~~the~~ visual electro physiology, the visual evoked potential (VEP) is also related to ~~the~~ changes in the intensity of light stimulus and the light intensity, ~~the~~ changes ~~of~~ in frequency and flash pictures and pictures. Experiments show that the evoked potential response arising from the change of intensity and frequency is greater than that which ~~occurred~~ occurs under light of fixed intensity and fixed frequency; the evoked potential response arising from the flash picture stimulus is greater than that ~~by~~ from the stimulus of light of simple uniform intensity; the evoked potential response arising from a changing flash picture is greater than that ~~by~~ from a simple flash picture, the evoked potential response from pictures with a high contrast is larger than that from those of low ~~contract~~contrast. As the ~~above-mentioned~~ therapeutic apparatuses described above adopt oscillating impulse circuits ~~of~~ with simple structures, their flash frequencies are fixed and neither the monotony ~~and the~~nor the light intensity of the flash can ~~neither~~ be changed automatically. Usually, they provide an invariable stimulus using ~~single~~ one or two types of light, which produce a low picture contrast ~~of pictures~~. ~~Due to~~Given the limitations of therapeutic method or light source, the range of ~~wavelength~~ wavelengths of the light deviates from the central area, ~~that~~ to which the pyramidal

cells of human body's retina are most sensitive~~-to~~. These apparatuses, compared with ~~the achievements~~ advances in modern electro physiology, are ~~obviously~~ clearly ~~backward~~ underdeveloped and inadequate, and hinder ~~the~~ further improvements in the ~~of~~ curative effect. Also, ~~due to~~given the limitations on ~~of~~ the structures and circuit designs of the ~~above-mentioned~~ apparatuses described above, their operating principles and methods are complex, which ~~bring~~ cause ~~great~~ significant inconvenience and ~~troubles~~ problems from ~~to the~~ young patients and ~~negatively~~ adversely impact ~~affect~~ the actual curative effects.

This invention aims to provide a ~~kind of~~ visual biological frequency spectrograph that~~,~~ ~~which~~ employs ~~adopts~~ several well-arranged groups of light-emitting devices as an illumination lamp house. Those devices give off red, green, blue or yellow light and their light wavelengths are closer to the central peak value wavelengths of the light, to which human body's retina pyramidal cells are most sensitive ~~to~~ and which best excite~~d~~ ~~with~~with the cells. Meanwhile, the optimized treatment scheme, which performs ~~the~~ a shift of multiple groups of spectrums, shift of frequencies, shift of pictures and ~~the~~ a shift of light intensity, are programmed. By way of changing the multi-route and frequency of the micro-computer controller, flash lights and flash pictures are produced with ~~their~~ spectrum, intensity, frequency and picture ~~changing~~ that automatically change according to the preset procedure and the music program ~~automatically~~. The light and picture ~~given out~~emitted stimulate and exercise the different types ~~-~~of visual cells in the retina, improve the conductive function, increase the sensitiv~~e~~ity ~~value~~ of the visual cells to biological lights of specific wavelengths, raise the sense input and critical convergence frequency of human eyes and further reduce the requirements for operation and enhance the curative effect.

This invention can be implemented ~~by~~ using the following technical scheme. On the basis of the fact that there are three types of pyramidal cell in human retina, which are most sensitive to lights of a specific wavelength, and on the basis of the allopathic mechanism and ~~the achievements on~~advances in ~~the~~ VEP, light intensity, frequency, spectrum, flash, ~~and~~ picture contrast and other areas in the field of visual electro physiology research, this invention adopts light-emitting devices as illumination light source 4. They emit light in red, yellow, green and blue with an intensity of 30~~~~~-200mcd and a wavelength of 600~~~~~-680nm, 570~~~~~-590nm, 530~~~~~-565nm and 430~~~~~-460nm.

The treatment program and music program are preset on microcomputer controller 5, and perform several ~~groups~~ sets of spectrum shift, intensity shift, image shift and several ~~groups~~ sets of fixed frequency shift below CFF as well as music frequency shift.

These programs control the multiplex driver amplifier 33 and ~~drive~~ operate each group of lighting devices on the lamp-house 4 ~~to work~~ in sequence, produc~~e~~ing flash lights and flash images resulting from automatically ~~the~~ changes ~~of~~ in spectrum, intensity, frequency and image according to the preset treatment program,

~~automatically and can play~~with music played synchronously. The fl~~Fl~~ash lights and flash images produced by lamp-house 4, ~~whose~~with ~~graphic scene contrast~~image contrast ~~is~~ further enlarged through ~~many times~~repeated reflection by the reflectors 3, stimulate and ~~take~~ exercise ~~of~~ the three different types of pyramidal cells in the yellow spot area of the retina, improve ~~the function of~~ vision conduction, increase the threshold value of optic sensitivity, increase the frequency of convergence between visual input and critical point, and finally improve and enhance the curative effect.

This invention has the following active effects: 1. ~~supply~~ It supplies many types of ~~lamp-house~~lights of specific wavelengths more attuned to the ~~closer to sensitiveness and excitement~~sensitivity of ~~of~~ pyramidal cells in the ~~in~~ human retina, and better able to excite those cells, ~~and~~ flash lights whose light intensity, frequency, spectrum and image can change automatically, and flash images with larger ~~graphic scene contrast~~image contrast. The ~~lamp-house~~lights of specific wavelength, flash lights ~~that~~ with constantly changing spectrum wavelength, frequency and light intensity ~~constantly change~~, and images which alternative~~ly~~ ~~change can~~more effectively stimulate the optic nerve ~~more effectively~~, reducing~~e~~ adaptability— ~~for~~ to flash lights and flash images. M~~, me~~anwhile the music frequency spectrum biologic light produced can massage the ocular tissue, activate many types of optic cells in the o~~o~~ptic nerves more effectively, improve the function of vision conduction, enhance optic ~~resolving~~ resolution~~power~~, and increase the frequency of convergence between visual input and critical point, ~~thus~~ thereby effectively enhancing treatment of ~~enhance curative effect to~~ amblyopia ~~effectively~~. 2. Th~~the~~ music frequency spectrum biologic light produced can massage ocular tissue, accelerate tissue circulation, ~~and~~ while the flash light and its light intensity change can lead to pupil reflection and crystal adjustment, improve the capability of dioptric adjustment, eliminate optic fatigue and delay presbyopia. 3. T~~t~~he eye patch can be turned with ease to ensure ~~the~~ that the eye treatment ~~avoiding~~ is free of external ~~outer~~ disturbances and ~~make the~~can cover completely the other eye not ~~in treating to be covered completely~~be treated, ~~and~~ improving the~~e~~ curative effect. 4. Th~~the~~ shell is on the base and its angles of turning and pitching can be adjusted freely. ~~It~~ This ensures ~~the eye in treating~~that the eye being treated can ~~aim~~ be readily directed to ~~at~~ the sight aperture ~~conveniently to satisfy th~~even among~~e~~ patients of different ages. 5.— G~~g~~entle and relaxing music ~~come together~~is supplied simultaneously. Synchronous effects ~~in~~ on hearing and ~~seeing~~ vision can further excite the sympathetic nerves, enhance the interest of ~~enfant~~ infant and juvenile patients in ~~treating~~ treatment and enhance the curative effect. 6. ~~because~~ Because ~~of adopting~~a microcomputer control technique is used, the ~~automatic~~ degree of automation through the course of treatment ~~degree of whole treating course can be enhanced~~is increased, and the requirements of usage and operation for the patient are reduced. ~~That~~ This helps to cure and ~~popularize~~ promote family health care ~~for families~~. 7. ~~obviously~~ There are clear improvements in the curative effect and ~~reduce~~ a reduced treatment ~~cure~~ cycle. According to clinics, the general efficiency rate for ~~treating~~ the treatment of amblyopia can reach 94.18%, while that ~~of treating~~for the treatment of pseudomyopia can reach 99%.

—_—_

~~The~~ A further explanation of the invention will be given next with the attached ~~figures~~drawings.

—_—_

~~Figure~~ Drawing 1 ~~is~~ shows the ~~an~~ overall frame ~~sketch map~~ of the invention, including (a) its planform—_and (b) cutaway-.
Drawing ~~Figure~~ 2 ~~is a connecting sketch map for~~ maps the microcomputer controller.
Drawing ~~Figure~~ 3 is a schematic diagram of microcontroller MCU HT84XX adopted in the invention.
Drawing ~~Figure~~ 4 ~~is a sketch map of~~shows the light emitting devices unit.

In Figure 1, cylinder 6 is a ~~through~~ hollow cylinder-, and front cover 2 is set with an eyelet and fastened to the front of the cylinder 6. At the back end of ~~the~~ cylinder 6; along the central line ~~sets~~ is a lamp-house 4, ~~and~~ with reflectors 3 between the lamp-house 4 and the front cover 2. The shell 1 has a bent surface with a round aperture ~~in~~ at the front, consisting of an upper cover and a lower cover. Around the round aperture ~~sets~~ is a pulling path and stop block, which are used ~~to connect~~for connection with the front cover. Inside ~~it sets~~is a power supply 11, a microcomputer controller 5 and sound-making device 10~~,~~; ~~the~~ shell 1 is connected with base 9 through bracket 7. B~~The b~~racket 7 is fastened on the lower part of the shell 1. The connection between the bracket 7 and the base 9 is spherical. The shell 1 can turn freely at 360 degrees and adjust the pitching angle with the base 9 as a benchmark. At the front of the shell 1 ~~sets~~ is a program start switch 12. T~~When t~~ouching the switch 12~~,~~— will start or stop the treatment program ~~will begin to work or stop~~ automatically. The front cover 2 is ~~set~~ located on the round aperture in the front of the shell 1, the two central lines are superimposed and they are connected with the shell 1 in a retaining ring structure-, which ~~make~~ enable the front cover 2 and the eye patch 8 ~~set~~ on the front cover ~~can turn~~to execute 180--degree turns. On one end of the eye patch 8 is an eyelet, ~~and~~ while the other end is closed. The end with an eyelet is key jointed on the front cover 2, its central line is ~~superposes~~ superimposed with the central line of the eyelet on the front cover 2 and the central line of the round aperture on the front of the shell 1.—_By turning the eye patch 8, the eye ~~in treating~~being treated will ~~aim at~~be directed to the eyelet on the eye patch 8, ~~and~~ while the other eye ~~not in treating~~ will be covered by the other end of the eye patch 8. The ~~above-mentioned~~ reflectors 3 mentioned above consist of three rectangular~~le~~ reflectors, ~~whose section is in triangle~~with a triangular section. To produce a solid image and increase ~~graphic~~ the image scene contrast, the reflectors 3 ~~had better~~should consist of three trapezoid baffle-boards which reflect by a single side and one end of the section towards the lamp-house 4. The sound-making device 10 is fitted inside the shell 1, ~~with~~ which has many holes ~~on corresponding shell~~ to ensure sound ~~to~~ transfer. The power supply 11 is ~~of~~ a direct current, such as a battery~~,~~; although a ~~rectifying voltage~~ stable~~ilized~~ power supply ~~also~~ can also be used.

Figure 2 illustrates the control circuit of the specific MCU ~~adopted~~ used in the microcomputer controller 5. In the figure-, MCU 30 is the main controller and its

audio output port is connected ~~with~~ to the sound-making device 10. The RS switch for program selection 32 can choose different treatment schemes and programs to satisfy the different needs of patients~~'~~ ~~needs of different types~~. Switch 12 is ~~the~~ a touch switch ~~which~~ that ~~starts~~ launches and resets the treatment program ~~to work and reset~~. ~~On the~~The MCU 30 sets the treatment program and music program, and ~~inside it~~ has ~~fitted~~ a sound synthesizer mounted internally. Multiplex driver amplifier 33 is connected ~~with~~ to the I/O port of the MCU 30, and its driver ports are connected ~~with~~ to each lighting device on ~~the~~ lamp-house 4 separately. The multiplex driver amplifier 33 is a multi-channel—_current amplifying circuit. The power supply 11 is connected ~~with~~ to the MCU 30 by switching ~~of~~ power supply 31. To control the work of the lamp-house 4, the stated lamp-house 4 ~~is composed~~consists of LEDs ~~whose~~ of wavelength ~~is~~ 600-~~~~~680nm, 570-~~~~~590nm, 530-~~~~~565nm and 430-~~~~~460nm, respectively, and each group of LED is in the same color, formings a geometrical ~~graph~~ —figure~~in order~~. The number of each LED group is 1-8. To make ~~graphs~~ figures more abundant, several groups of LED can be adopted, ~~usually with 4-8~~with four to eight groups being the most common.

To improve reliability and reduce production costs, the ~~stated~~ MCU 30 is a microcomputer mask chip ~~setting~~ that sets the treatment program together with the music program-, ~~and~~ with a sound synthesizer, such as HT84XX.

In Figure 3, the type of the MCU 30 is HT84XX. Its I/O ports 2, 3, 4, 5 are connected ~~with~~ to transistors Q1, Q2, Q3 and Q4, respectively, –in the driver amplifying circuit, ~~respectively~~ and—_~~the~~ LED L1, L2, L3 and L4 are ~~driven to work~~operated through the amplified electric current of the transistors . Because L5 needs a smaller current, it can be ~~driven~~ operated directly by I/O port 1 and port 9 of the MCU-. The colors of the LED in the figure are shown in R (red), G (green), Y (yellow) and B (blue). I/O port 7 and port 8 are connected ~~with~~ to the program status indicator lamp; port 1 and port 9 of I/O are connected ~~with~~ to and ~~drive~~ operate one group of LED L5, making L5 produce light ~~varying~~ that varies in intensity by setting different resistance values ~~of~~ for the current limiting resistors R10 and R15 and by setting on/off programs at different I/O ports; ports 21-24 are connected ~~with~~ to the START/STOP and RS switch for program selection separately, and ~~through~~ with the RS switch different treatment programs can be chosen. Ports 14 and 15 ~~in~~ in the figure are— for –music signal output-, and are connected ~~with~~ to the sound-making device SP. The SP can be a ~~loud~~speaker, and headphones can be used ~~and can also adopt earphone~~. Port 15 is connected ~~with~~ to an anode of 5 Volt DC power, and port 18 connects to the earth.

The t~~T~~reatment program and music program are set in the MCU. The ~~working~~ operating procedure ~~of~~ of the treatment program mainly follows the basic principle of making the LED produce a spectrum shift, light intensity shift, frequency shift and image change. The m~~M~~usic program can be ~~the mode of~~in MIDI or ~~sound~~audio format, although MIDI is preferred for a clearer and more comfortable~~.~~ ~~To make~~ rhythm ~~clearer and more comfortable~~, and reduce program memory~~, it had better adopt MIDI mode~~. The rhythm of the selected music ~~is~~ should be clear and comfortable ~~in rhythm~~. The treatment program mainly controls the flashes and

changes of LED. The~~,~~ ~~the~~ following ~~working~~ operating procedure and controll~~ing~~ ~~means~~ can be applied: touch START/STOP switch, program controls L1 (blue) to light for 1/3 second---L2 (red) to light for 1/3 second--- L3 (red) to light for 1/3 second--- interval of 1/2 second---repeat the ~~above~~ procedure, the ~~working~~ operating period is two~~2~~ minutes; followed by—_L1 to light for 1/6 second--- L2 to light for 1/6 second--- L3 to light for 1/6 second--- interval of 1/2 second---repeat the ~~above~~ procedure, the ~~working~~ operating period is one minute; followed—_by program control,—_I/O port 1 is "1~~",~~," make L5 (yellow) light for one second---control I/O port 9 and port 1—_all are "1~~",~~," L5 (yellow) light for one second--- control I/O port 9 to be "1" and port 1 to be "0~~",~~," L5 (yellow) light for one second--- control I/O port 9 and 1 all are—_"0~~",~~," L5 (yellow) extinguish for 3 seconds---repeat the above procedure for ~~2~~ two minutes; then use the music program to synchronously play music and control the turning and shift speed rate of LEDs ~~along~~ to accompany ~~with the~~ changes ~~of~~ in music frequency. The ~~range of~~ lighting change frequency of LEDs with music changes ~~is~~ ranges from 0.5-20Hz, the ~~shift l~~shift lighting_ ~~-order~~ sequence is L1 (blue) ---L2 (red) ---L3 (red) ---L4 (green), ~~timing for 3~~for three minutes, ending with treatment program and music program finish and standby. The flash means of LEDs can have many changes, such as shift lighting in sequence—_or shift flash in sequence , ~~and~~ or could ~~can also~~ be random shift lighting or random shift flash. The ~~duty rate of~~operating rate of flashes ~~also~~ can be many sets.

Figure 4 is an implementation example of the LEDs that lined ~~on the~~ lamp-house 4. The LEDs are red, yellow, green and blue semiconductor LED groups, of ~~which the~~ wavelengths ~~are~~ 600~~-~~-680nm, 570~~-~~-590nm, 530~~-~~-565nm and 430~~-~~-460nm, respectively. The number of lighting device groups i~~i~~s five, and ~~forms~~ they form a geometrical ~~graph~~figure ~~in order~~. The~~,~~ ~~the~~ number of LEDs in each group is 1-8, and in the same color, such as L1, L2.....L5, in the figure-. The number of LEDs in each group depends on the ~~needs~~requirements for lighting intensity and ~~forming~~ image of the chosen LED. If more ~~abundant~~ images are required, ~~you can choose many~~a large number of LED groups ~~of LED~~ and more ~~numbers of each~~ LEDs in each –group can be chosen. To reduce the volume and improve image quality, LEDs can be sealed on the board of lighting devices.

Attached Drawings

Drawing 1

Drawing 2

Drawing 3

Drawing 4